C L A I M S

1. A waveguide type optical device characterized by comprising:

a substrate;

an optical waveguide formed upper the substrate;

functional optical waveguides provided to the optical waveguide;

at least one of an optical input end face and an optical output end face for the optical waveguide which are provided to substrate end faces which are ends at longitudinal direction sides of the substrate; and

at least one of an input optical waveguide connecting the optical input end face and the functional optical waveguides, and an output optical waveguide connecting the optical output end face and the functional optical waveguides, wherein

the at least one of the input optical waveguide and the output optical waveguide is formed so as to form angles other than 0 with the functional optical waveguides at the at least one of the optical input end face and the optical output end face,

and so as to make angles formed to the substrate end faces at the respective sides different from 90°.

2. The waveguide type optical device according to claim 1, characterized by further comprising:

a package case into which the substrate is to be housed, wherein,

in order for angles formed by at least one of a light input to the optical input end face and a light output from the optical output end face, and substrate end faces which are ends at short-side direction sides of the substrate or package case side faces at short-side direction sides of the package case to be desired angles,

angles formed by at least one of the input optical waveguide structuring the optical input end face and the output optical waveguide structuring the optical output end face, and the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the respective sides are made different from 90°.

3. The waveguide type optical device according to claim 1, characterized by further comprising:

a package case into which the substrate is to be housed, wherein,

in order for an absolute value of angles formed by at least one of a light input to the optical input end face and a light output from the optical output end face, and the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case to be made smaller than an absolute value of angles formed by a light input to the optical input end face or a light output from the

optical output end face, and the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case when it is assumed that at least one of the input optical waveguide and the output optical waveguide is parallel to the functional optical waveguides,

angles formed by at least one of the input optical waveguide and the output optical waveguide with the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the respective sides are made different from 90°.

4. The waveguide type optical device according to claim 1, characterized by further comprising:

a package case into which the substrate is to be housed, wherein,

in order for a light input to the optical input end face or a light output from the optical output end face to be input or output in a direction parallel to the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case,

angles formed by at least one of the input optical waveguide and the output optical waveguide with the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the

respective sides are made different from 90°.

5. The waveguide type optical device according to claim 1, characterized in that a monomode optical fiber is provided in the vicinity of the optical input end face or in the vicinity of the optical output end face.

6. The waveguide type optical device according to claim 2, characterized in that,

given that an equivalent refractive index of the input optical waveguide or the output optical waveguide, or a refractive index of the substrate is n_1,

a refractive index or an equivalent refractive index of a medium which the input optical waveguide or the output optical waveguide contacts is n_2,

an angle formed by the optical input end face or the optical output end face to the perpendicular line with respect to the substrate side faces is θ_{0A},

angles formed by the input optical waveguide or the output optical waveguide to the substrate side faces are θ_{1A}, and

angles formed by a light incident into the input optical waveguide or a light emitted from the output optical waveguide to the functional optical waveguides are $\Delta\theta$,

and when the $\Delta\theta$ is given by $\Delta\theta = (\theta_{0A}-\theta_{1A})n_1/n_2\ \theta_{0A}$,

in order for angles formed by a light incident into the input optical waveguide and the package case

side faces, or angles formed by a light output from the output optical waveguide and the package case side faces at the short-side direction sides to be desired angles,

the θ_{1A} and the $(\theta_{0A}-\theta_{1A})$ are made different from 0.

7. The waveguide type optical device according to claim 3, characterized in that,

given that an equivalent refractive index of the input optical waveguide or the output optical waveguide, or a refractive index of the substrate is n_1,

a refractive index or an equivalent refractive index of a medium which the input optical waveguide or the output optical waveguide contacts is n_2,

an angle formed by the optical input end face or the optical output end face to the perpendicular line with respect to the substrate side faces is θ_{0A},

angles formed by the input optical waveguide or the output optical waveguide to the substrate side faces are θ_{1A}, and

angles formed by a light incident into the input optical waveguide or a light emitted from the output optical waveguide to the functional optical waveguides are $\Delta\theta$,

and when the $\Delta\theta$ is given by $\Delta\theta = (\theta_{0A}-\theta_{1A})n_1/n_2-\theta_{0A}$,

in order for an absolute value of the $\Delta\theta$ to be smaller than an absolute value of the $\Delta\theta$ in a case where a value of the θ_{1A} is made to be 0,

the θ_{1A} is made different from 0.

8. The waveguide type optical device according to claim 4, characterized in that,

given that an equivalent refractive index of the input optical waveguide or the output optical waveguide, or a refractive index of the substrate is n_1,

a refractive index or an equivalent refractive index of a medium which the input optical waveguide or the output optical waveguide contacts is n_2,

an angle formed by the optical input end face or the optical output end face to the perpendicular line with respect to the substrate side faces is θ_{0A},

an angle formed by the optical input end face or the optical output end face to the perpendicular line with respect to the package case side faces is θ_{0B},

angles formed by the input optical waveguide or the output optical waveguide to the substrate side faces are θ_{1A}, and

angles formed by the input optical waveguide or the output optical waveguide to the package case side faces are θ_{1B},

the n_1, the n_2, the θ_{0A}, and the θ_{1A} satisfy a relationship of $\theta_{0A} = n_1\theta_{1A}/(n_1-n_2)$, or the n_1, the n_2,

the θ_{0B}, and the θ_{1B} satisfy a relationship of $\theta_{0B} = n_1\theta_{1B}/(n_1-n_2)$.

9. The waveguide type optical device according to claim 2, characterized in that,

in order for an absolute value of angles formed by at least one of a light input to the optical input end face and a light output from the optical output end face, and the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case to be made smaller than an absolute value of angles formed by a light input to the optical input end face or a light output from the optical output end face, and the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case when it is assumed that at least one of the input optical waveguide and the output optical waveguide is parallel to the functional optical waveguides,

angles formed by at least one of the input optical waveguide and the output optical waveguide with the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the respective sides are made different from 90°.

10. The waveguide type optical device according to claim 2, characterized in that,

in order for a light input to the optical input end face or a light output from the optical output end face to be input or output in a direction parallel to the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case,

angles formed by at least one of the input optical waveguide and the output optical waveguide with the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the respective sides are made different from 90°.

11. The waveguide type optical device according to claim 3, characterized in that,

in order for a light input to the optical input end face or a light output from the optical output end face to be input or output in a direction parallel to the substrate end faces which are the ends at the short-side direction sides of the substrate or the package case side faces at the short-side direction sides of the package case,

angles formed by at least one of the input optical waveguide and the output optical waveguide with the functional optical waveguides are made different from 0, and angles formed to the substrate end faces at the respective sides are made different from 90°.

12. The waveguide type optical device according

to claim 2, characterized in that a monomode optical fiber is provided in the vicinity of the optical input end face or in the vicinity of the optical output end face.

13. The waveguide type optical device according to claim 3, characterized in that a monomode optical fiber is provided in the vicinity of the optical input end face or in the vicinity of the optical output end face.

14. The waveguide type optical device according to claim 4, characterized in that a monomode optical fiber is provided in the vicinity of the optical input end face or in the vicinity of the optical output end face.